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POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

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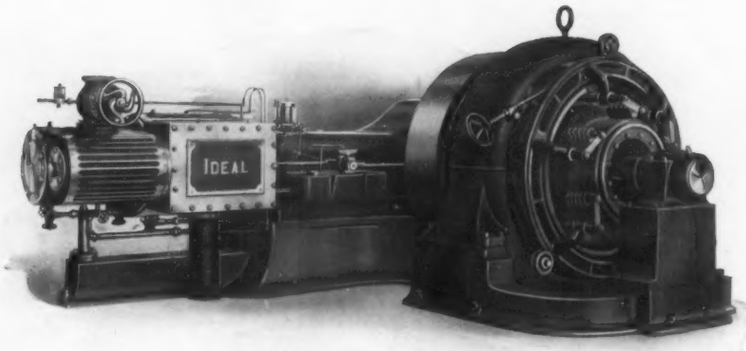
IDEAL ENGINES



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JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

VOLUME XXV SAN FRANCISCO, NOVEMBER 5, 1910. NUMBER 19

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POWER FOR PUMPING CALIFORNIA OIL

The announcement that the San Joaquin Light & Power Company recently contracted with one oil company for 2500 kw. to be used exclusively for pumping oil emphasizes the fact that a great amount of power is required to pump the fifty million barrels, and more of oil that are annually produced by California. There are about five thousand producing wells in the State, each one requiring about a 20 h.p. installation, a total of one hundred thousand horsepower, exclusive of the power required for drilling.

sents a lease, is a steam boiler plant which supplies steam to the surrounding pumping engines. The usual equipment consists of three 80 h.p. return tubular boilers with feed water heater and purifier. Oil is ordinarily burned as fuel though there are many plants burning natural gas.

Water suitable for boiler use is scarce and some wells originally sunk in search of oil, but now producing water, are netting their owners a good income, in cases as high as $50 per month per oil well supplied.

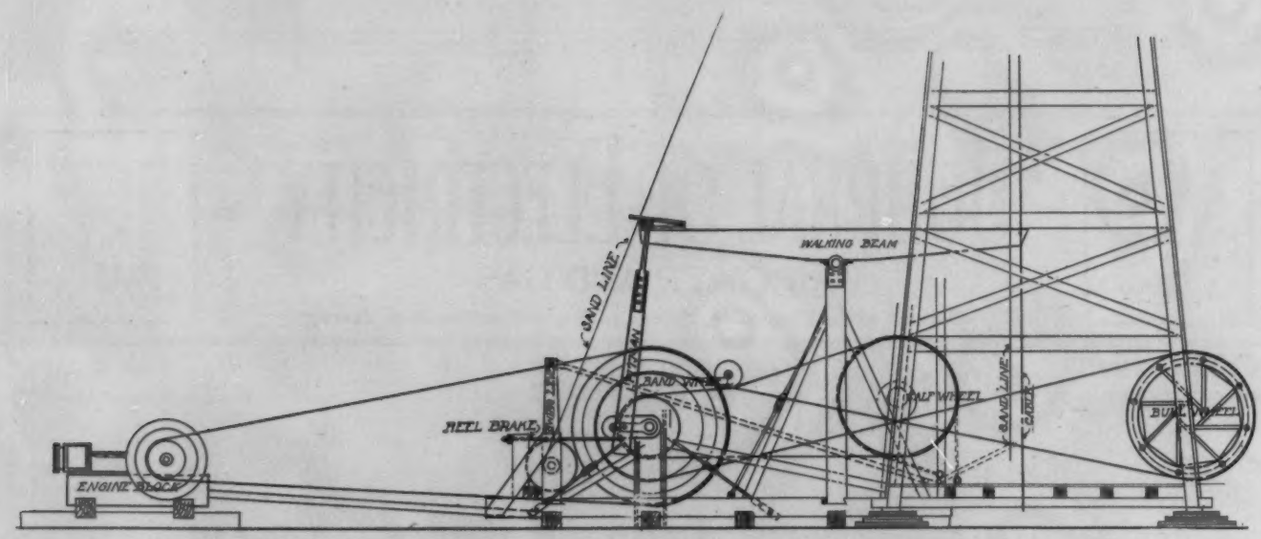
Oil Pumping Rigs in Coalinga Field.

Heretofore power has been mostly supplied by steam plants, though gas engines are used wherever natural gas is available and electric motors are being rapidly introduced and bid fair to soon take the first place. This substitution is being accomplished by the adaptation of the three-phase induction motor to the peculiar speed condition and load variations required in this work, the details of which will herein be developed after a brief description of the steam practice employed.

The accompanying view shows nearly two hundred wells in the Coalinga field. Close inspection will show that the nucleus of each cluster, which repre-

Even this water must be purified and causes much trouble with scale, foaming and corrosion. A feed-water heater and purifier is almost indispensible at most plants, but there yet remains a wide field for improving water conditions.

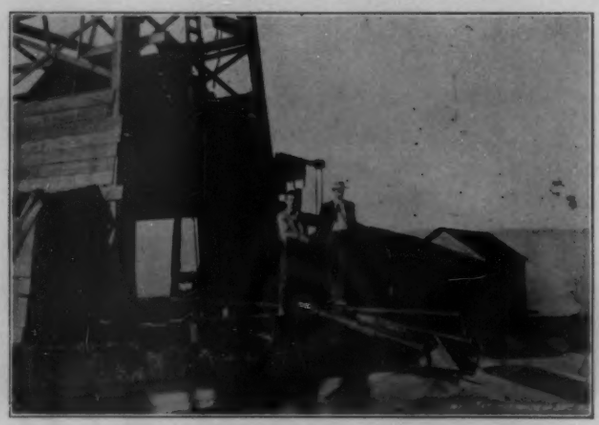
Pipe lines varying in length from 50 to 2500 feet convey the steam from the boilers to the engines at the wells. Although these pipes are well insulated with asbestos and oil sand and buried in the ground, there is a large loss due to condensation. The water in the steam gives much trouble in operating the engines and the entire efficiency of the system is low.



Sketch of Oil Pumping Rig.

Steam Pumping.

The engines are of the non-condensing reciprocating type and rated at from 13 to 30 h.p., according to the depth of the well. As may be seen by the accompanying sketch the engine is belted to a band wheel which operates a walking beam to which a string of steel rods is attached, the rods being 20 ft. long and varying from ¾ to ⅞ in. in diameter. The rods in turn actuate a single action plunger pump at the bottom of the well, the pump consisting of a plain working barrel with a ball valve at the bottom and



A Flowing Well and Unused Pumping Rig.

a single valve in the plunger. A short stroke is used in pumping, quick on the down motion and slow on the up, the beam being adjusted to keep the oil at the desired level in the casing. Because of the liability of the pump becoming clogged with sand, constant watchfulness is necessary on the part of the operator to provide a proper pumping speed.

If the pump does become sanded, it is necessary to "pull" the casing and rods in order to get at the seat of the trouble' This is a heavy job that severely taxes the capacity of the engine and occasionally even collapses the derrick.

Gas Pumping.

Where natural gas occurs, many companies are now pumping with gas engines. Owing to the lower cost of gas these plants are operated as cheaply as can be desired, though the first cost is greater than an electric motor and the gas engine is proverbially unreliable, often failing when most needed. The cost of lubrication is also high, experience showing that oftentimes the lubricating oil alone costs as much as does the electric power necessary to operate an equal capacity in motors. There is also present the constant menace that the gas supply may fail at any time. These factors however are not serious enough to deter those fortunate enough to have a gas supply from utilizing it as long as it proves available.

Electric Pumping.

A special adaptation of the three-phase induction motor has recently been devised so that it now meets the peculiar and exacting requirements of oil pumping. This, combined with the fact that electric power is now being distributed throughout many of the fields, particularly those within the radius of the San Joaquin Light & Power Company, is causing the rapid substitution of electric power for the older methods. The leading manufacturers of electric motors have conducted a long series of tests to adapt their machines to this use and as a result of their successful issue are now taking contracts for installation.

The motor employed is of the polyphase induction type with form wound rotor, having three collector rings and external controller and resistance. Variable speed is obtained by varying the external resistance in the rotor circuit by a cylinder controller much like that used in street car service. One recent test showed that the stroke of the pump can thus be varied from 15 to 27 per minute as required and also that the down stroke was much faster than the up, the motor speed varying from 210 to 470 r.p.m. when pumping 15.2 strokes per minute to from 495 to 625 r.p.m. when pumping 26 strokes per minute. The motors may be either back-geared or belted to a counter shaft and thence belted to the band-wheel.

The actual horsepower required for pumping varies from 5 to 8, and for pulling out rods and tubing from 30 to 50, depending upon the depth of the well. The most practical installation is a motor that will take care of both pumping and cleaning, a requirement met by the Y-delta motor. With line voltage of 440 and motor connected in delta full line voltage is impressed on the coils of the motor. If the motor coils are Y-connected the voltage on each coil is 57.7 per cent of the line voltage or 254 volts. As the torque of a motor varies approximately as the square of the voltage a 440 volt delta connected 20 h.p. motor gives 6.67 h.p., when Y-connected ($440^2 : 254^2 = 20 : 6.67$). The power factor and efficiency is practically the same when running at full load on the Y-connection as when running full load on the delta-connection, the control apparatus having the same effect in either case. The change from Y to delta connection is accomplished by the use of a triple pole, double throw switch usually mounted on the motor frame. The same method of speed control applies for both connections, the operating handle turning in two positions to allow for reversing the motor.

The advantages of the electric motor as compared with both steam and gas are its low initial cost and its cheapness of operation. Its economy and its convenience make it the ideal power. The annual repairs for a motor is less than 5 per cent of its cost, while those on a steam engine are about 9 per cent and a gas engine about 15 per cent. There is no fuel nor water required and the labor charge is much reduced. Its one possible disadvantage is an interruption of service against which every precaution is being taken and for which ample compensation could be provided in the contract for electric service.

SEATTLE ELECTRIC COMPANY'S STUDENT COURSE.

Acting upon a suggestion by S. C. Lindsay, assistant electrical engineer, officials of the Seattle Electric Company have approved of a plan for giving electrical students a practical education in the departments of the Seattle Electric Company.

The object of this course is to develop men to meet the needs of the company in responsible operating positions. The course will be of 2½ years' duration and will consist of training in electrical construction, both station and line work; central station operating, both steam and electrical apparatus; a small amount of meter testing and such office engineering work as conditions permit will also be given.

Applicants who have not had a college training will be required to pass an examination in order to prove their qualifications for entering the course. Examination will be more of a practical than of a technical nature.

All students must be over 21 and under 30 years of age. Persons already in the employ of the company will be given preference when selecting students. Students not already in the employ of the company and who may be selected from the list of applicants shall receive $50 per month upon entering the course. A record of the students will be kept and their showing in each department reported by the head of the department, so as to determine their fitness for any particular line of work.

THE OIL SITUATION FROM A GAS MAN'S VIEWPOINT.[1]

BY H. W. BURKHARDT.

The existence of alphaltum and semi-solid bitumen has been known in Santa Barbara county since 1792, but no attempt at development was made until about seventy-five years thereafter.

The first well for crude oil, the "Pico Well," was drilled in 1867 near Newhall, Los Angeles county.

In 1872 sufficient oil was struck in Ventura county to justify the erection of a refinery and the piping of the oil to the coast for shipment to San Francisco.

The occurrence of oil in Ventura county lead several individuals to form oil companies with the intention to drill for crude petroleum.

In the City of Los Angeles the first successful well was drilled in 1892. Within the next few years over 700 wells were drilled. Today the City of Los Angeles harbors 450 producing wells with a production of 428,000 barrels for 1909.

Los Angeles County.

Los Angeles county comprises five distinct fields: Los Angeles City, Whittier, Fullerton, Puente and Newhall; with probably another one to be developed in the Santa Monica mountains.

The Los Angeles City field includes Sherman and Salt Lake. The entire field extends toward the coast, and will be a large factor in the oil market for many years to come.

The Whittier field was one of the latest to be developed in Los Angeles county, and is probably not yet fully developed. The wells vary from about 1000 feet to about 4000 and perhaps 2200 feet would be a fair average. The quality of the oil is good and the oil is sought after by refiners and gas works. Much of the product is piped to Los Nietos on the Santa Fe Railroad, and is there loaded into cars for shipment, but practically the entire field lies 700 to 900 feet above the harbor of San Pedro, 18 miles away, thus affording an easy and cheap means of transportation to ship side.

The Santa Fe Railway, associated with others, started work in Fullerton about 1895 and within a short time oil was found in large quantities. Wells in the territory of Fullerton run from 2000 to 4000 feet in depth. Work is still going on in the field and the output is being increased yearly. The Santa Fe Railway and the Hall Company practically control the output of the entire field.

The Puente Oil Company has drilled a large number of wells, most of which have been good producers. The field is still being extended, although there have been some dry holes, and quite a number of the wells on the edge of the field have ceased to yield a remunerative amount. Most of the oil produced in the Puente field goes to the refinery at Chino, to which place there is a six inch pipe line.

Newhall field produces a very high grade oil. Most of the product goes to the Standard Oil Company, being piped to Ventura and from there shipped by steamer to the refinery at Point Richmond.

rapidly increased within the next ten years to such an extent that it is more than likely that by 1920 the Coal-

[1] Paper read before the 18th annual convention of the Pacific Coast Gas Association, September, 1910.

Ventura County.

In Ventura county there has been a steady production of oil for about 36 years, and from present indications, the already large number of wells will be doubled within the next ten years. There have been drilled in Ventura county not less than 500 wells, and it is estimated that of the entire amount more than three-fourths are now producing. There are various reasons why the balance of the wells are non-producers. Some few were dry holes in the first place, others were not drilled deep enough, in many cases tools were lost in the wells, and a few had become exhausted. The oil-bearing sands are found at various depths in the different localities. There is generally a stratum of shale, alternated by a stratum of sand. The water troubles are comparatively small and there is practically no difficulty in shutting-off water from the oil-bearing stratum, when same is encountered. In a part of the Santa Paula canyon no water is encountered.

Of the twelve distinct fields in Ventura county, Santa Paula is now the largest producer. Many new companies have lately gone into the field, and it is more than likely that Santa Paula will stay at the top of the different oil fields in Ventura county.

The transportation facilities are excellent. Most of the producing territory lies at an altitude of from 800 to 1500 feet, at a distance of from three to twelve miles from the railroad, and of from six to thirty miles from the Pacific Coast.

Practically all the oil produced in Ventura county is of light gravity. There is very little oil in the entire district around Santa Paula that runs less than 18.5 degrees Beaume and the entire production will easily average 24 degrees Beaume.

Santa Barbara County.

Santa Barbara contains four separate fields, though it is likely that three of them are connected.

The four fields are: Santa Maria, Gracioso, Lompoc and Summerland.

The Santa Maria is the principal one, and probably Gracioso and the Lompoc fields will be connected with the main field. Summerland is a distinctive field as the oil produced is of an entirely different character.

The wells in the Santa Maria fields are deep and are large producers. Notable is the Hartnell gusher, which has produced over 2,000,000 barrels of oil. The Palmer well is at this time producing some 6000 or 7000 barrels of oil daily, and is actually producing more oil than can be handled, owing to insufficient transportation facilities.

Considerable new work is being done and the field is being extended both to the east and north.

Many of the wells are producing water and an unfortunate feature of this water trouble is that the oil is produced from shale rather than from sand. The water has a tendency to slake the shale, thereby precipitating some of its constituents and forming an emulsion with the oil. There is no serious trouble in separating the water from the oil, but the sludge or emulsion thus formed cannot be entirely separated, and leaves a certain percentage of sediment in the oil that it is well nigh impossible to separate therefrom by any process thus far evolved. This sediment amounts in some cases to as much as 4 per cent and can neither be refined nor burned. It is possible that some means will be found of separating this material from the oil in the future, but so far it has not been accomplished. It has been a very serious matter with some of the older companies operating in the Santa Maria field.

This emulsion must not be confounded with the sludge formed in testing crude oil for water by the gasoline method. Gasoline when mixed with any oil of an asphaltum base separates in a spongy form, being in reality a flaky brown substance called sludge. This is asphaltene which normally remains dissolved in oil and which has practically the same value for fuel and gas manufacture as any other part of the crude oil.

In the greater part of this field the oil is of light gravity, except in the eastern portion where the Palmer gusher produces oil of 14 degrees Beaume. The development of the field has been rapid, considering the difficulties encountered in drilling, and there are now something like 170 completed wells with a production of about 11,000,000 barrels per year, and the field is being constantly enlarged by the discovery of new wells, both to the south and east.

At Summerland about 350 wells have been drilled belonging to some 40 companies. There never was a time when the production of the field averaged ten barrels per well. The greatest amount produced in any one year was 208,370 barrels in 1899, since which time the production has gradually decreased until at the present time it is not in excess of 65,000 barrels per year.

The California Liquid Asphalt Company had a refinery at Summerland. The production of the field, however, has fallen so low, that the refinery was moved to another field.

By many geologists it is thought that there is another and more productive sand underlying the Summerland field, but so far no deep drilling has been carried on.

South from Summerland lies Carpenteria. Several wells, at least one of which has attained a depth of over 3000 feet, have been sunk on the low lands near Carpinteria. Oil was found in all of them but in none in commercial quantities.

The gravity of the oil from the Summerland field runs from 13 degrees to 16.5 degrees Beaume, though the gravity of the oil is generally decreasing as the wells produce more and more water.

Fresno County.

The Coalinga field is bearing oil at depths varying from 700 to 3600 feet. The productive area does not cover much more than 100 acres and the most determined efforts have so far failed to extend the field. The oil runs in specific gravity as high as 0.844 and is of a yellowish green fluorescence.

Coalinga has already produced over 50,000,000 barrels of crude oil, and, according to the report of the United States Geological Survey, there are approximately 3,000,000,000 barrels of oil in already proven area. At the present rate of production of about 1,000,000 barrels per month, it would take 300 years to exhaust this vast supply; but the present rate will be

inga field will be producing at least double what it is now. It is, of course, very unlikely that anything like 3,000,000,000 barrels will be produced from this field, but it is certain that the field will produce large quantities of oil for many years to come.

Transportation facilities consist of pipe lines to Monterey, Point Richmond and Port Costa.

isolated and the difficulties encountered in getting in supplies and fuel have hampered developments.

The Kern River field is about four miles across and nearly six miles long, and has produced almost 130,000,000 barrels of crude oil.

While the field produced for 1909, 14,508,000 barrels of oil, it is not likely that this amount will ever

Map of California Oil Fields

Kern County.

Oil has been known to exist in Kern county since 1870, but no very extensive developments were attempted until after the first development of the Coalinga field, although some work had been done both at McKittrick and Sunset previous to that date.

Along the western edge of the county and on the north line of the county at Devil's Den, much work has been going on for several years past and oil has been found in paying quantities. The extent of these fields is not yet known, but it is very likely there will be developed large tracts of good oil land at some of these places. Devil's Den district is somewhat

be reached again. Owing to continued low prices, many wells and a few whole leases had been closed down, waiting for better prices. Kern River is in no sense exhausted, but it is likely that there will be a gradual decline in production. Probably the field will never produce more oil in the future than it has in the past and it is likely that another ten years will have seen the production brought down to a nominal amount.

The depth of the wells vary from about 300 feet for the small producers of heavy oil near the break, to about 1500 feet for those back on the hill. The total number of producing wells is about 1410. The field is gradually extending further north.

The Midway field, known to exist for some years, never marketed any oil until within the last three years, except a small quantity from the extreme south and where this field joins Sunset, of which field it is really a continuation.

The proven wells of the Midway field proper cover a total length of 12 miles, and while the width is by no means proven, there is every reason to believe that the field is at least wider than McKittrick.

McKittrick was originally known as Asphalto, but the asphaltum industry did not prove profitable owing to excessive cost of production and transportation. Very little oil development was done at that time though several wells were sunk which yielded a few barrels daily. When the slump in oil came, the McKittrick field was practically closed down for over a year and for nearly four years very little new work was done. After the better times came, McKittrick got its revival, and today there are over 140 producing wells, with an average monthly production of over 450,000 barrels. The field is being rapidly extended to the north, south and east.

Transportation facilities consist of the Southern Pacific Railway and the Standard Pipe Line.

Sunset is the oldest field in Kern county and has until 1908, been almost wholly neglected. The principal cause of the delay in the development of this field has been the lack of transportation facilities and the heavy gravity of the oil.

The railway facilities have been increased, and the field is reached by the Standard pipe line. During the last 25 years many wells were put down and most of them produced oil of a heavy gravity. There were no railroads and the heavy oil could not be piped, so it was finally decided to build a refinery on the ground and turn the heavy oil into refined asphaltum, the product being hauled to Bakersfield by wagon.

On March 15th, 1910, the world's greatest gusher, the Lakeview, was struck with an output of 50,000 barrels per day, the oil being of a good quality and of 20 degrees Beaume. It seems reasonable from the work already done that the deeper the wells will be, the lighter the oil and the heavier the flow.

In the southern portion of the Sunset field are several wells producing a light oil of good quality, but the output is rather small.

Northern California.

The drilling for oil north of San Francisco, in Humboldt and Contra Costa counties and at Half Moon Bay does not seem to be successful in spite of the considerable work done.

South of Los Angeles.

The districts of Del Mar, Morena and Otay, San Diego county, have indications of petroleum and development operations are unusually active at the present time.

Texas.

It is a fact that the producers of eastern fields have long since reached their maximum and are becoming rapidly exhausted. The Texas field has much territory yet to drill that will result in large productions, but there the wells show an enormous gas pressure which generally results in short lived wells where the gas is allowed to escape.

Colorado, Wyoming and Utah.

It is quite possible that more fields will be opened in Colorado, although that state has reached its maximum production in the discovered fields. Wyoming will produce some oil. Utah already has a little oil, and there remain very good prospects.

Alaska.

Numerous seepages occur in Alaska, and several attempts have been made to drill wells, but so far without success. There is great difficulty in getting in material and in the actual drilling, owing to the fact that the entire surface of the country is covered with a deposit of sea mud some hundreds of feet thick, and it has been found to be almost impossible to force casing through this formation. It is not likely that the field, if there be a field, will be developed for many years to come.

Mexico.

There can be no question that Mexico soon will produce enormous quantities of crude oil. If this field is a continuation of the Texas field or Coastal Plain field, it seems reasonable to expect that the life of those fields may be taken as an example of the probable duration of this one. The Texas fields have to a large extent, been ruined by careless drilling, and the total production of that State has fallen off and is still falling off with great rapidity. This also is true of the Southern Louisiana field, so that these fields need not be reckoned with as likely to ever increase in production.

The oil fields of old Mexico are situated along the eastern shore from Tampico south nearly to Yucatan. A few seepages are along the western coast of Lower California, and one instance of crude oil seeping near the City of Mexico. Most of the new fields are located in the State of Vera Cruz and are conveniently reached by boat from Tampico, being about seventy miles up the river from the latter port.

In Mexico nearly all the proven or partly proven land is owned by a few large companies, and this fact alone will certainly not hasten development, so it is more than likely that before the product of the Mexico fields becomes a factor in the world's market, the outout of other fields will be decreased in a corresponding amount.

The Mexican Petroleum Company has a pipe line to Tampico and another to the City of Mexico. The railroads of Mexico are rapidly adopting oil for fuel.

Very likely the British government will obtain most of their naval supply there in the future, as the Mexican fields will undoubtedly, when fully developed, produce an enormous quantity of oil, which will be shipped from Tampico and Vera Cruz.

It is probable that Mexico will not export any crude oil to California before the opening of the Panama Canal. All the producing wells are located in the eastern part of Mexico, and the few seepages occurring on the western coast have not yet been drilled for oil.

Chemical Composition of California Petroleum.

As regards its ultimate composition, crude petroleum consists essentially of carbon and hydrogen, together with oxygen, and usually widely varying amounts of nitrogen and sulphur. California crude

oils contain from 0.5 to 1.2 per cent nitrogen. The occurrence of sulphur in crude oil is due to the fact that free sulphur is always present in the earth's crust, though in highly variable amounts. Sulphur is freely soluble in oil, and occurs in the crude petroleum not only in a mere solution, but also very firmly combined to carbon and hydrogen as thio-ethers and mercaptans, commonly called organic sulphur.

California crude oil greatly varies in character, some oils being of a greenish or bluish fluorescence, while others are viscid and almost black. The specific gravity ranges from 0.993 to 0.850 or from 11 degrees Beaume to 34 degrees Beaume.

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Analysis of California Oils

The oils of California contain sometimes as much as 45 per cent asphaltum and for that reason the gasoline test for determination of foreign matter in the oil is not always practicable on account of the asphaltene forming a sludge with the gasoline. The centrifugal test is more correct, but the only way to determine accurately the percentage of water and foreign matter in crude petroleum is the distillation test.

The amount of sulphur in California crude oil varies between 0.5 per cent and 2.5 per cent. The only thoroughly satisfactory process for determination of sulphur is that of combustion in oxygen in the Mahler bomb and determination in the usual way as barium sulphate.

The accompanying table shows analysis of 78 different samples if California crude oil, taken from oil districts shown on the map.

For the large amount of work in gathering these samples credit is due Mr. Henry C. Kayser and every analysis was made by him in the laboratory of the Southern California Edison Company at Los Angeles.

In collecting the samples to be tested greatest care was taken, some of them were taken directly at the well, some of them from storage tanks, while others were taken from tank cars as received at the gas plants. The samples were taken with a so-called "oil-thief" and placed in a large receptacle and the whole thoroughly mixed. In all classes the specific gravity was ascertained by picnometer at 60 degrees Fahrenheit, after the water was allowed to settle.

Summary of the Oil Situation in California.

Los Angeles City field with its extension toward Santa Monica (Salt Lake, Sherman, Beverly, Malibu), will be a large factor in the oil market for many years to come, although most of the wells show a high percentage in sulphur.

The oil from the Whittier field is sought after by the refiners and the gas plants in Los Angeles and its vicinity. The output is still increasing.

The Santa Fe Railway practically controls the entire production of the Fullerton field. The output is being increased yearly.

The wells of the Puente fields reached their maximum; the output per month is small and does not exceed 3000 barrels.

The oil from the Newhall field is out of question for the gas works; most of the product goes to the Standard's refineries.

Santa Paula oil is first class oil for gas making; contains less than one per cent sulphur; oil is of light gravity. Transportation facilities are excellent. Production seems to have reached its maximum.

The oil from the Santa Maria field contains between 1.50 and 1:75 per cent sulphur. In some oil water trouble is met with. Production is increasing. Union Oil Company handles about four-fifths of the entire production.

The production in the Summerland field is rapidly decreasing. All of the oils contain over one per cent sulphur.

On an average the oil from Coalinga field yields less than one per cent sulphur. Transportation facilities consist of pipe lines to Monterey, Point Richmond and Port Costa. The production is increasing.

The production in Kern county, comprising Kern River, McKittrick, Midway and Sunset (Maricopa), is rapidly increasing through several gushers struck in March, 1910. The oil is of good quality and the transportation facilities will be developed more and more.

Experts who have studied the fields have reported that the oil beds in California will be prolific producers for more than half a century. A geologist who is considered an authority on oil, has stated that the present proven oil territories of California were sufficient to produce at least 75,000,000 barrels, every year for the next fifty years.

The price of oil was always subject to severe fluctuations. From experience we know that, when we had only a few wells in California, oil was selling as high as 75 cents a barrell; with the increase in number of wells and no readiness for the consumption, the oil dropped as low as 10 cents a barrel. Later on, while the consumption was increasing, oil went up again.

The question of supply and demand, production and consumption, is a very important one. We know that when the consumption increases and the demand becomes greater, the price of oil goes up; on the contrary, when production is greater than consumption, the price must naturally sink, unless there is enough storage capacity.

Since March, 1910, through the big gushers in Maricopa, the production was on the increase.

In March the average daily production for the Coast, San Joaquin Valley, and Southern Fields combined amounted to	194,278	bbls.
The average daily consumption reached	183,209	"
Average daily surplus	11,069	"
The stocks Feb. 28, 1910, amounted	19,225,950	"
The stocks March 31, 1910, amounted	19,569,085	"
The stocks April 30, 1910, amounted	20,704,352	"
The stocks May 31, 1910, amounted	22,940,599	"

Recent data in reference to surplus stock has not been obtainable. The oil producers show a tendency to withhold the information.

Unquestionably there is overproduction, and just now this condition is making buyers hold off, expecting a break in the price. The great marketing concerns will probably be unable to handle for a time the output of some of the big wells. On the other hand, transportation facilities are also increasing but they do not seem to keep up the race with the production, proof: The steady monthly increase of storage.

TELEPHONE SERVICE ON THE ISTHMUS.

The plan of laying an underground cable to provide permanent telephone facilities along the Panama railroad relocation has been abandoned. A requisition was placed some time ago for the necessary material, but only one proposal was received in response to the advertisement for bids for the cable, and the price, 48 cents a foot, was considered excessive. It has been arranged to construct a telephone line of iron poles, with their bases set in concrete, starting at Caimito and proceeding north to Monte Lirio. At Monte Lirio the relocation work is still in progress, but it is expected that it will be completed by the time the telephone construction force reaches there. The new pole route will carry 20 No. 10 copper circuits. At the south end of the relocation, comprising the section between Paraiso and Corozal, the pole line will parallel the railroad right-of-way for most of the distance, but will diverge at the approach to Miraflores tunnel, in order to go around the high part of the hill. There is no immediate demand for the construction of this part of the line, and it will not be started until after the Gamboa-Gatun section is completed.

CHEMICAL CONTROL OF OIL GAS MANUFACTURE.[1]

BY E. L. HALL.

By chemical control is meant the technical supervision over the process of manufacture necessary for maintaining or improving the quality of the product, while at the same time endeavoring to reduce the cost per unit. Chemical control will be treated of in this paper from the standpoint of conditions on the Pacific Slope where the bulk of illuminating gas is made from crude oil alone.

The problems confronting the oil gas chemist are mainly the same as in water gas or coal gas. They are, however, if anything, simpler, due to the elimination of coal as a manufacturing material and of coke and tar as by-products, but there are some problems peculiar to oil gas.

The routine duties of the oil gas chemist may be divided under the following heads:

1. Control for illuminating and calorific values.
2. Control for purification.
3. Control for napthalene troubles.
4. Miscellaneous control.
5. Control of operating conditions and technical report.
6. Valuation of raw materials.
8. Appliance work and illuminating photometry.

Control for Illuminating and Calorific Values.

A sufficiency of tests should be made to enable the foreman or head gas maker to keep the product uniform. The larger the holder capacity, the easier it will be to maintain a uniform standard.

All tests for record should be made at the outlet of the main storage holder. I would strongly deprecate the practice of estimating the quality of the product by test at the inlet of the storage holder for the following reasons:

The proper place for the final valuation of the quality is as near as possible to the actual consumer, that is to say, the outlet of the storage holder. At this point the loss in candle-power becomes more gradual, for it is not generally recognized that there is quite an appreciable drop in quality while the gas travels from inlet to outlet of the holder. The effect of the consumer's service is well represented by the small laboratory service.

The control of the actual operation of the generators can still be carried out by means of the test line at the inlet of the holder with the difference now that the tests are no longer for record.

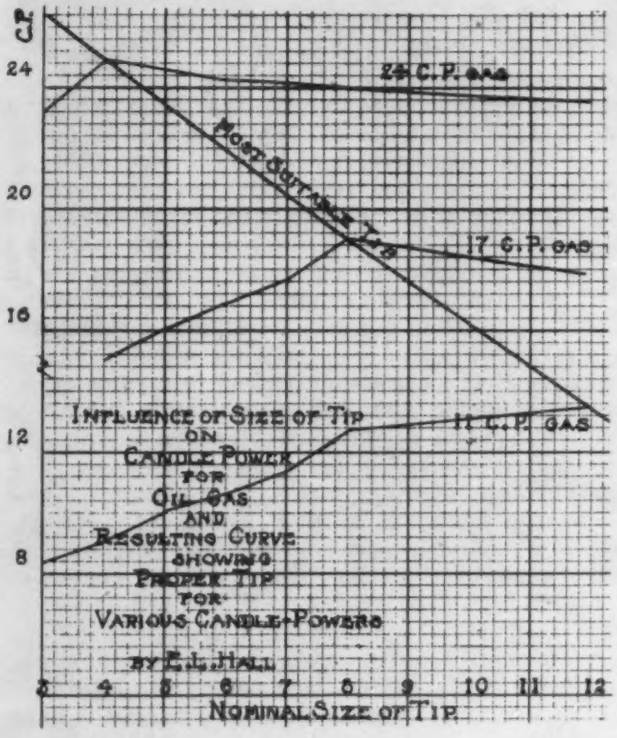
By this means of control. the candlepower of the gas in the street mains should be kept within a daily maximum variation of one candle, and within a monthly average maximum and average minimum difference of one-quarter candlepower.

A thorough knowledge of the working of the generator and the result to the candle-power in the holder from any particular variation from the routine and the ability to offset this by some other change, is the true secret of quality control, which is, of course, rendered much easier when a number of sets are operating together. It is greatly desirable that the night

[1]Paper read at eighteenth annual convention Pacific Coast Gas Association, September, 1910.

foreman or engineer be able to continue this system of control.

In making tests for illuminating power on the bar photometer, it is very seldom that enough attention is given to selection of the proper tip to develop to the full the candle-power inherent to the gas under test. In this connection, it may be of interest to show the accompanying diagram worked out for oil gas, illustrating the wide variations of candle-power with tips of different sizes. In this experiment full time was given at each test for the gases of different quality to purge out the photometer meter and connections.


24
20
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24 C.P. GAS
MOST SATISFACTORY TIP
17 C.P. GAS
11 C.P. GAS
INFLUENCE OF SIZE OF TIP ON CANDLE POWER FOR OIL GAS AND RESULTING CURVE SHOWING PROPER TIP FOR VARIOUS CANDLE-POWERS
BY E.L. HALL
3 4 5 6 7 8 9 10 11 12
NOMINAL SIZE OF TIP

Two things are apparent from the diagram:

1. The tip orifice should be smaller with an appreciation in the quality of the gas, and vice versa. This will result in a change of the issuing velocity of the gas, drawing in more primary air into the flame, thus burning in the inner cone a greater amount of the carbon of decomposition. In finding the proper tip, one merely determines what part of the carbon in the gas it is necessary to burn in the inner cone to raise the remainder to the highest degree of luminosity. This happens generally when the flame is just on the point of smoking.

2. That where there is any considerable change in the quality of the gas to be tested, it is imperative to find the proper tip for the test by a preliminary trial, and this is the more important as the quality diminishes.

It becomes natural to wonder where the consumer "comes off at" in this case. The answer is, that having determined the most satisfactory candle-power to carry, and having educated the consumer up to the proper tip for this candle-power, the quality of the gas made should not vary enough to render a change of tip necessary. Happily, moreover, the illuminating standard is gradually yielding to the calorific standard, which is really of more concern to the consumer. The practice of estimating illuminating values with the open tip has been shown to be open to considerable error, and even the proper open tip for the quality under consideration does not develop the full value of the flame.

The use of Argand burners, and especially of the No. 2 Metropolitan (Carpenter) burner thus becomes imperative. The latter, as shown by the diagram, will develop from two to three more candle-power than the most suitable tip and is adjustable for the variation in quality. The relative effectiveness of this burner diminishes with the higher illuminating values, when tests are made at five cubic feet per hour, and with the same length of chimney.

I will not go more fully into bar photometer work except for the following hints:

There is no excuse at present for making bar photometer tests with any other than the pentane standard.

The light on the bar photometer should burn continuously. It is better that the gas for testing should not pass through a service meter.

If the gas shows a tendency to deposit light oils in the test meter, the latter should be frequently drained out and refilled. The service and photometer connections should be well graded towards drips which should be regularly drained.

In connection with the illuminating value of oil gas, it must be borne in mind that high value by no means signifies good service to the consumer. It has been my experience that anything above 19 or 20 candle-power is going to give a great deal of dissatisfaction, mainly by reason of imperfect combustion, and because of the larger size of the flame which causes increased breakage in globes, chimneys and shades.

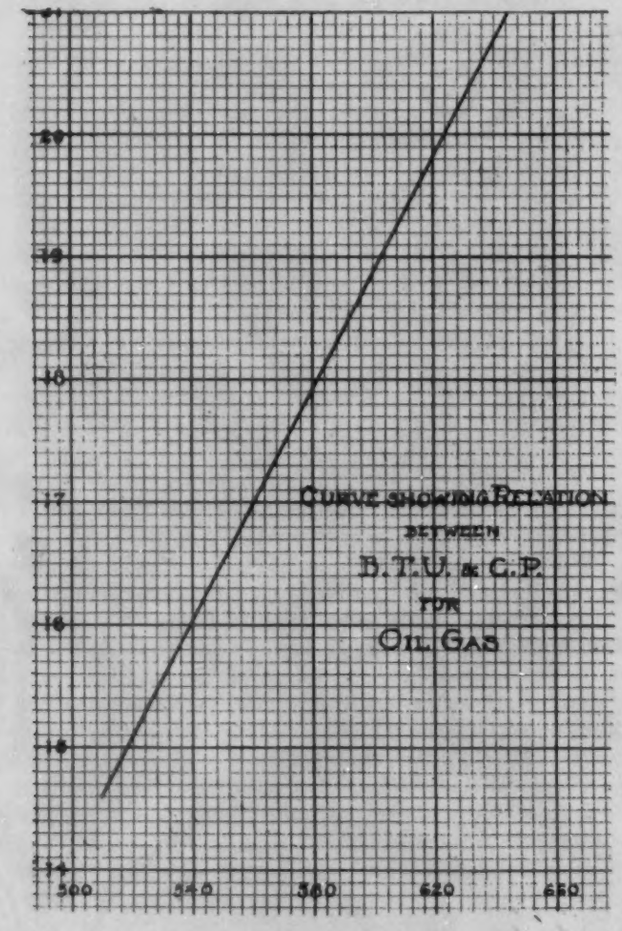
While the time has not yet arrived when we can altogether abandon the illuminating standard of quality, yet the calorific requirements can now be said to be of the first importance. It is doubtless true, that with most manufactured illuminating gases, high calorific value follows from high illuminating value. The relation between illuminating and calorific values seems to be fully constant for oil gas where the manufacture is not complicated by the utilization of lamp black as a generator fuel. The accompanying diagram will serve to represent the relation between the two. It cannot be said definitely that the same is unvariable or that the curve should be a straight line. The diagram has been plotted from the averages of many simultaneous illuminating and calorific tests.

Calorific tests should invariably be made as closely as possible after the illuminating test, and preferably upon the same stored sample which can also be used for the gas analysis. In this way, we are enabled to obtain definite relations between the three tests, and we have in addition, checks upon the daily valuation of the product.

A point often overlooked in calorimetry is the maintaining of the water supply, room temperature and the waste gases from the instrument at as near the same temperature as possible. For this purpose a water tank holding sufficient supply for twenty-four hours is very advisable. In making the calorimeter tests the water heated by the gas under test should be weighed,

not measured. The very sensitive thermometers used in making the observations of temperature should by all means have been compared and found in agreement with a calibrated thermometer.

It is well for the gas chemist to avail himself of the splendid service afforded by the Bureau of Standards at Washington, D. C., for the calibration of all the laboratory instruments where especial accuracy is required, among which may be mentioned the calorimeter thermometers and the pentane lamp.



Control for Purifications.

Probably no department of the works is more vital than the purifiers. It can be said also that the vigilance of the chemist should nowhere else be more strictly exercised. Owing to the varying percentages of sulphur in crude oil from different fields, the purifiers may be called upon most unexpectedly to handle greatly increased amounts of hydrogen sulphide.

The purification control should include the following routine work:

A. Daily estimation of the amount of hydrogen sulphide.

There is no better rapid test for this purpose than the titration of the raw gas with a standard solution of iodine of which 1 c.c. corresponds to 100 grains of sulphur per 100 cu. ft. The Tutwiller burette is very convenient for this purpose. The use of starch solution as the confining fluid may be used in place of mercury, providing that the titration be done at once upon collecting the sample. It will be necessary to make a blank test to ascertain the amount of the iodine solution to color the starch solution to the shade of blue which is to be used for the end point of the titration, which is to be deducted from the amount used to take up the hydrogen sulphide.

Where a number of purifiers are operating in series, the work performed by each box may be ascertained by making a series of tests in which every box successively occupies the same relative position.

It is possible by this method of testing, to determine exactly what percentage of the total sulphur is being removed by each box. It may be found that a box showing foul in the first position may still be removing a large percentage of the total sulphur.

B. The condition of the material in the purifiers should also be ascertained by monthly analysis for sulphur, tar and cyanogen products. The following method has been found to be satisfactory for estimating on the same sample, moisture, total cyanogen and sulphur.

Ten grams of the oxide which has been removed from the purifier at the close of the revivification and bottled, are weighed out into a watch glass and dried to constant weight in an air bath at 100 degrees C. The loss in weight gives moisture. The same sample is now introduced into a Soxhlet extraction apparatus and extracted for one hour with redistilled bisulphide of carbon. The extract evaporated to dryness represents the sulphur contained in the sample and should be melted before weighing. The residue of oxide can be used for estimating the cyanogen contents. The same is slightly warmed with a dilute solution of caustic soda, the solution cooled and made up to 500 c.c. of which an aliquot part is used. Make slightly acid, warm gently, and precipitate with a dilute solution of ferric chloride. The percipitate of Prussian blue must be washed several times by decantation and finally on the filter until free from chlorides, dried, ignited and weighed as ferric oxide, which can be calculated back to Prussian blue, in which form the cyanogen is to be reported.

Purifying materials used for oil gas may, with good management, be run up to as high a percentage of sulphur as in coal gas or water gas manufacture. The Prussian blue contents have a very important bearing upon the life of the oxide because the iron present in the Prussian blue is permanently incapable of sulphur removal and also acts as a coating over the remainder of the oxide of iron. Samples of oxide used for oil gas have come under my observation containing as high as ten per cent by weight of Prussian blue.

The estimation of tar in oxide should not be necessary in a well-equipped plant. The approximate estimation of the same can be carried out by treating the sample with solvents to dissolve out the tarry matters which may then be evaporated to dryness.

To insure the freedom of the purified gas from traces of hydrogen sulphide, no more delicate test can be devised than the well known sugar of lead test. It is possible, by using a revolving disc carrying a chart similar to a Bristol recording gauge, impregnated with lead acetate, and dried, which is exposed to a tiny jet of the gas to be tested, to obtain a continuous record of freedom from hydrogen sulphide.

C. As is well known, the sulphur contents of oil gas are not limited to hydrogen sulphide. A large portion of the sulphur appears in an organic form, which

by reason of the difficulty attending its removal, would seem to have deserved more attention than has been given it.

The presence of this impurity is not indicated by the sugar of lead test and can only be estimated by a combustion of the gas. The analysis is conveniently carried out as follows: A small jet of gas, burning at the rate of 0.2 cu. ft. per hour, which has been accurately measured by passing through a test meter, is kept burning in a glass flask of about one liter capacity, containing two openings. The side opening communicates with several wash bottles filled with broken glass or marbles and containing dilute caustic soda. The other opening of the flask is at the bottom and communicates with another series of three absorption bottles containing a solution of sodium carbonate to which has been added a few drops of bromine. The outlet of these bottles is connected to a source of suction. By means of a two hole stopper, the gas jet is inserted into the side opening flask. A rapid flow of air, purified by bubbling through the caustic soda bottle, is drawn through the flask and the sodium carbonate absorption bottles. The products of combustion of the gas, which contain the organic sulphur as sulphurous acid, pass with the air into the sodium carbonate bottles, where the sulphurous acid is oxidized by the bromine to sulphuric and retained by the sodium carbonate. After one to five cubic feet of gas have been burned, the sodium carbonate solution is transferred to a beaker, and the bottles and flask well rinsed with distilled water. The solution, made slightly acid with hydrochloric acid, is precipitated with barium chloride in the usual way for estimation of sulphur, which is reported in grains per 100 cu. ft.

D. While not strictly to be classified as routine work, the differentiation of the organic sulphur compounds in oil gas bears such a close relation to the study of the subject that the work should be carried on more than intermittently. Good methods are not yet available to enable the gas chemist to report with certainty as to the nature of the various sulphur compounds present.

The absorption of bisulphide of carbon may be effected with alcoholic potash. The alkaline solution is evaporated, dissolved in distilled water and made slightly acid with acetic acid. A very dilute solution of copper sulphate is added, drop by drop, until a permanent yellow precipitate of cuprous xanthate is produced which is allowed to stand and filtered off. The precipitate is washed on the filter, dried, ignited and weighed as cupric oxide, from which the sulphur is calculated and reported as bisulphide of carbon in grains per 100 cu. ft.

It is not certain that other sulphur compounds may not also react with the alcoholic potash.

It is desirable that a good method be worked out for the separation and estimation of mercaptans, the presence of which may be shown qualitatively by means of mercury compounds.

Thiophene and sulphocyanides have been found in oil gas but not quantitatively estimated. The subject is worthy of a good deal of investigation and good working methods for the separation and estimation of these bodies as occurring in illuminating gas would prove very acceptable.

Control for Naphthalene Troubles.

Owing to the high heats employed for making oil gas, naphthalene troubles are as much present as in either coal gas or water gas. Owing to the large amount of scrubbing water necessarily employed for the washing out of lamp black, the gas does not enjoy that full contact wth tar and tar oils which might serve to reduce the quantity of naphthalene.

Happily, on the Pacific Coast, the problem is no longer perplexing. There are several plants at present equipped with scrubbers for washing the gas with crude oil. Where this method is employed, naphthalene troubles are practically unknown. Where the chemist is called upon to determine the amount of naphthalene present in the gas, he is likely to be confronted with analyses showing quite variable amounts of naphthalene. It is my opinion that the analysis itself is not at fault, and that the fluctuations observed are actually present. The method employed is as follows:

The sampling is done by inserting into the main, to a point about one-third of the diameter, a glass tube bent to a right angle at one end, which is pointed in the direction of the flow of gas. The other end communicates with a Pettenkoffer tube for absorption with standard picric acid solution. The tube consists of a piece of glass combustion tubing about three feet long, sealed at one end. The other end is slightly widened to receive a two-holed rubber stopper. The tube leading the gas from the main is carried without joints through the stopper to the other end of the Pettenkoffer tube and is drawn down to a fine opening. The outlet of the apparatus communicates with a test meter for measuring the volume of gas used and is placed at a slight angle from the horizontal. A measured amount of the picric acid solution is run out from a burette into the apparatus, the same is connected up to the main and about 5 cu. ft. are bubbled through slowly. The picric acid is then transferred to a rubber stoppered bottle which can be exhausted of a part of its air. The bottle and contents are heated in warm water until the naphthalene precipitate is dissolved. The solution is allowed to cool over night and the precipitate filtered off and washed with as little cold water as possible. The picric acid is now titrated against a standard caustic soda solution. The loss in picric acid is calculated back to the naphthalene equivalent and the same reported in grains per 100 cu. ft.

The picric acid solution may be used qualitatively to indicate the presence of large or small amounts of naphthalene by bubbling some of the gas rapidly through a test tube containing a few c.c. of this solution. Should no precipitate appear after two minutes bubbling, the gas may be taken as being reasonably free from naphthalene.

(To be continued.)

Examination for aid, Coast and Geodetic Survey, is announced by the United States Civil Service Commission on November 22-23, 1910, to fill about ten vacancies in the position of deck officer and similar vacancies as they may occur in the positions of aid and deck officer in the Coast and Geodetic Survey.

HORATIO A. FOSTER ADDRESSES LOS ANGELES SECTION A. I. E. E.

The Los Angeles Section of the American Institute of Electrical Engineers opened the year's proceedings with a dinner at the Hotel Hollenbeck, Tuesday evening, October 25th. Mr. C. G. Pyle was in charge of the preparations and the affair was unusually successful. There were eighty-nine members in attendance, great interest being taken in the paper of the evening, which was entitled "Necessity for Valuations" by Horatio A. Foster.

Mr. Foster took a broad view of this subject, quoting from Mr. Roosevelt's Decoration Day speech at Indianapolis in 1907, as follows: "At the outset let it be understood that physical valuation is no panacea; it is no sufficient measurement of a rate; but it will be ultimately needed as an essential instrument in administrative supervision. Therefore the physical valuation can never be more than one of many elements to be considered; but it is one element, and at times may be a very important element, when taken in connection with the earning power and business possibilities in reaching an estimate on the property and rights of a corporation as a going concern."

"The effect of such valuation and supervision of securities cannot be retroactive. Existing securities should be tested by the laws in existence at the time of their issue. This nation would no more injure securities which have become an important part of the national wealth than it would consider a proposition to repudiate the public debt. But the public interest requires guaranty against improper multiplication of securities in the future." Mr. Foster continued: "A true valuation must not only show the market value today of the physical or tangible property, but different percentages must be added for overhead charges, such as contractors' profit, engineering and superintendence, organization and legal expenses, interest during construction, insurance during construction, contingencies, discount on bonds, and in many cases, a percentage must be added for working capital. All of these (in some cases amounting to at least 25 per cent), must be added to the actual physical values in order to make a correct appraisal of the tangible property of the company.

A complete appraisal, exclusive of the above overhead charges, should show the separate total values for the following:

(A) Cost to reproduce new.
(B) Present value, which means the depreciated value.
(C) Physical development charges.

The above values may be used for:

(A) Rate making.
(B) Sale and transfer of property.
(C) Bond issue.
(D) Total capitalization.
(E) Establishing a uniform system of accounting.

In addition to these it may at times be necessary to make an additional study of values when considering improvements and extensions needed to provide adequate service.

After analyzing these various items in detail, Mr. Foster took up the much discussed problem of the Going Value or Good Will of a corporation, quoting a number of Supreme Court decisions and also the decisions of the various Public Service Commissions in the United States. In part, Mr. Foster said: "The Maine court ruled that the 'going concern' or 'established business' is an element of structure value. It may be defined as the cost of establishing, up to the level of the net income of the old plant at the date of taking, the business of a similar new plant (but not of a mere perfect system which the city might build), which is supposed to begin operation upon the date of the taking, the old plant going out of business at the same moment. Or, to put the same thing in another way, it is the measure of the greater value (at the date of taking) of an old established plant, over a similar new plant completed and ready for operation upon the date of taking. Or, to put the same thing in still another way, it is the measure of the cost of developing the business of a new plant to a point coincident with the net income, upon the date of taking, of the old plant."

He then took up Franchise Values, stating as follows: "This is one of the most troublesome questions that comes before the appraiser and the values have been determined in a number of different ways. Perhaps that made use of by the Ford Franchise Commission in New York State has been carried the farthest. In this case an appraisal is made of the physical property of the company and to this is added the capitalization of the net earnings of the company, such capitalization being made at 2, 3, 4 or 5 per cent, according to the class of the city; this total is then called the assessed value of the franchise which is taxed, and it is this method which has been fought so long and hard by all public utilities corporations in New York State, and which has, in every case, been sustained by the courts, clear up to and including the Supreme Court of the United States, and the companies have had to compromise or pay according to this assessment. This, perhaps, is the best evidence existing to show a method of valuing a franchise."

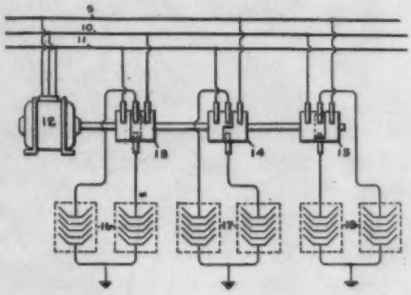
In concluding his paper Mr. Foster gave a masterful analysis of the subject of Depreciation. He quoted a decision of the Supreme Court of the United States rendered in the Knoxville water case, as follows: "A water plant, with all its additions, begins to depreciate in value from the moment of its use. Before coming to the question of profit at all the company is entitled to earn a sufficient sum annually to provide not only for current repairs, but for making good the depreciation and replacing the parts of the property when they come to the end of their life. The company is not bound to see its property gradually waste without making provision out of earnings for its replacement. It is entitled to see that from earnings the value of the property invested is kept unimpaired so that at the end of any given term of years the original investment remains as it was at the beginning. It is not only the right of the company to make such a provision, but it is its duty to its bond and stockholders, and, in the case of a public-service corporation at least, its plain duty to the public. If a different course were pursued the only method of providing for replacement of property which has ceased to be useful would be the investment of new capital and the issue of new bonds or stocks. This course would lead to a constantly increasing variance between present value and bond and stock capitalization—a tendency which would inevitably lead to disaster either to the stockholders or to the public, or both. If, however, a company fails to perform this duty and to exact sufficient returns to keep the investment unimpaired, whether this is the result of unwarranted dividends upon over issues of securities, or of omission to exact prices for the output, the fault is its own. When, therefore, a public regulation of its prices comes under question the true value of the property then employed for the purpose of earning a return cannot be enhanced by a consideration of the errors of management which have been committed in the past."

The Los Angeles Section will hold seven technical meetings during the coming year and an exceedingly interesting program of papers has been promised for presentation at these meetings.

The new executive committee is made up of the following members: J. E. Macdonald (chairman), V. L. Benedict (secretary), E. R. Northmore (assistant secretary), I. T. Dyer, J. A. Lighthipe, E. R. Davis and R. H. Manahan.

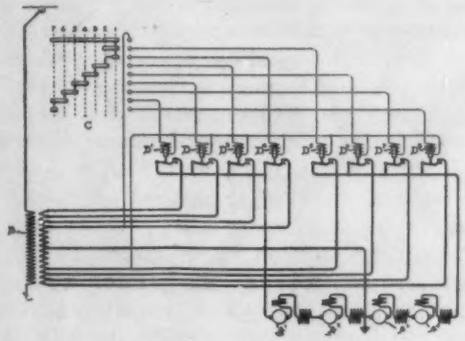
PATENTS

973,555. Lightning Arrester. Frank W. Peek, Jr., Schenectady, N. Y., assignor to General Electric Company. A protective device for alternating current systems comprising a



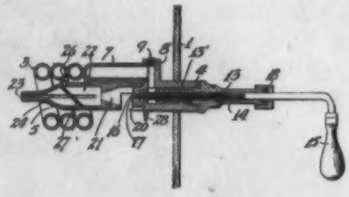
current limiting condenser forming a discharge path for abnormal potentials, and means for deriving a unidirectional potential from the system to be protected and for impressing said potential upon said condenser.

973,575. Motor Control. Walter I. Slichter, Schenectady, N. Y., assignor to General Electric Company. The method of operating a plurality of electric motors mechanically connected to drive a common load, and connected electrically in



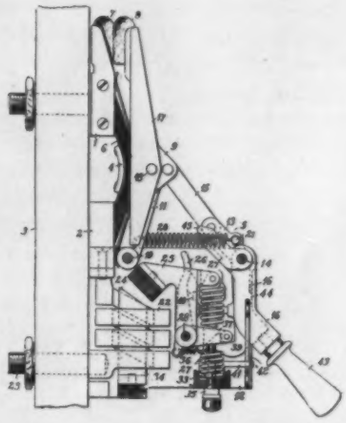
a plurality of groups, which consists in starting the motors by impressing reduced voltages on the groups, and increasing the voltages on said groups alternately step-by-step, the voltage being maintained on one group while the voltage on another group is being increased.

973,804. Gas Generating Oil Burner. Thomas Muehleisen, San Diego, Cal. An oil burner comprising an oil supply connection provided with a valve, a retort having an inlet connected to said valve, a regulating valve connected to the outlet of said retort, a combined burner head and mixing chamber connected to said regulating valve and extending therefrom



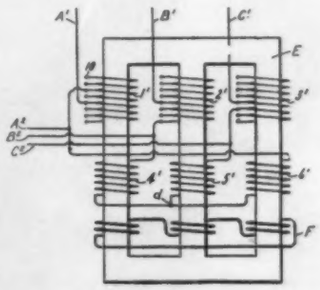
within the retort, said burner head and mixing chamber having a main outlet for producing a main burner flame and auxiliary outlets for directing auxiliary heat onto the retort, and a deflector in said mixing chamber to force the gas through said auxiliary outlets, said retort being out of the path of the main burner flame, so that the retort is subjected only to sufficient heat to vaporize the oil without carbonizing it.

973,924. Circuit Breaker. James C. Dow, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. In a circuit breaker, the combination with an insulating base plate, stationary and movable contact members, an interposed link, a bell crank operating lever having an inwardly extending hooked projection, and a bell crank latch pivotally supported between the operating lever and the base and



adapted to co-operate with the hooked projection of the operating lever in holding the breaker closed, of a release magnet having a movable core member pivotally mounted coaxially with the latch and resiliently connected thereto, and a handle lever supported coaxially with the operating lever and having a projection adapted either to close the breaker or to engage the latch in releasing the breaker.

973,579. Voltage Regulator. Charles P. Steinmetz, Schenectady, N. Y., assignor to General Electric Company. The combination with a three-phase system, of a three-phase Y-wound transformer connected thereto, regulating windings



in inductive relation with each of the transformer windings each connected in series with one of the transformer windings, the regulating and transformer windings being so connected that each transformer winding induces in each regulating winding a voltage substantially in quadrature with the voltage of a phase of the system adjacent to the regulating winding and so does not affect the latter voltage, and means for maintaining the neutral point of the transformer windings stable.

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POWER AND GAS

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DIRECTORS

R. J. DAVIS A. M. HUNT A. H. HALLORAN C. L. CORY E. B. STRONG

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NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office *ten days in advance of date of issue.* New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

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Speed Control of Induction Notors

Great ingenuity has been exercised in imparting to the alternating current induction motor a quality for which there is increasing demand, but one which is not inherent in this useful piece of apparatus—that of variable speed. Though the polyphase induction motor is of simple design and rugged construction and well adapted to many purposes, it is essentially a constant speed machine and, as such, difficulty amenable to variable speed control. Yet there are many cases in which hoisting, machine tool, traction or similar work is to be done, where a polyphase alternating current can be more conveniently and economically used either on account of unsatisfactory commutation or because of the characteristics of the power system.

No universal solution of this problem of speed adjustment has yet been devised, each method having some condition limiting its application. In general, speed control may be either internal or external to the motor. Internally this may be accomplished by changing the number of poles, giving rise to the multi-speed induction motor. Externally it is possible to vary either the frequency or the voltage and thus influence the speed.

The frequency may be varied by use of a frequency-changer set, by employing a separate generator for each motor, or by operating two or more motors in concatenation on the same load. Frequency-changer sets are too costly and too bulky to be practicable for this purpose alone; a separate generator is usually out of the question, and concatenation or tandem operation is obviously impossible with a single motor.

The voltage may be varied either by rheostat or compensator control of the stator or by rheostat control of the rotor, assuming that the stator is the primary circuit and the rotor the secondary. For a given torque the slip of an induction motor is approximately inversely proportional to the square of the primary voltage. While this method is frequently employed, particularly in places where there is danger of explosion or fire from an electric spark, it gives poor speed regulation and low power factor and efficiency at the lower speeds. The cost of a compensator is sometimes prohibitive, being about one-fourth that of the motor, while the results of primary control with rheostats are not as satisfactory as with compensators. The method most generally adopted is rheostat control of the rotor circuit, which though inefficient at low speeds, is at once cheap and simple.

From this brief survey it is seen that the three-phase induction motor cannot yet be called as satisfactory an adjustable speed machine as is the direct current series motor or even some of the single-phase machines. All the methods of controlling the speed, except the concatenation and the pole-changing, are wasteful, and these are limited to a few definite speeds. The others are make-shifts, complicated, unreliable or expensive, which are tolerated only because of the manifold compensating advantages of alternating as compared with direct current.

PERSONALS.

W. S. Heger, California manager of the Allis-Chalmers Co., is at Los Angeles.

Thomas Mirk, of Hunt, Mirk & Co., returned to San Francisco last Monday from a trip to Tacoma.

George Davis, of the Davis Electric Company of Santa Cruz, was a recent San Francisco visitor.

L. F. Youdall of the Electric & Machine Equipment Company of Stockton, motored to San Francisco this week.

L. M. Hancock, who is interested in electric lighting at Fortuna, Cal., was a visitor at San Francisco last week.

C. P. Baird, manager of the Lompoc Light & Power Company, of Lompoc, paid a visit to San Francisco during the past week.

Geo. B. Ferrier, Jr., sales manager for A. L. Ide & Sons, Springfield, Illinois, manufacturers of the Ideal engines, is at San Francisco.

Eward L. Brayton, president and general manager of the Pelton Water Wheel Company, recently went to Southern California on a business trip.

F. W. Gay, mechanical engineer with J. G. White & Co., is at Bakersfield installing a new steam plant for the San Joaquin Light & Power Company.

E. A. Quinn, of the Allis-Chalmer's Co.'s sales department, has returned to the San Francisco office, after a trip through the mining camps of Nevada.

J. V. Kunze, Eastern manager of the Pelton Water Wheel Company, who is making a tour of the Pacific Coast, is expected to arrive at San Francisco next week.

W. B. Moore, formerly district superintendent of the Pacific Telephone & Telegraph Company at Seattle, has been made division plant superintendent at Los Angeles.

C. C. Hillis, manager of the Electric Appliance Co., San Francisco, was elected Vulcan at the eighth annual meeting of the Rejuvenated Sons of Jove at Birmingham, Alabama.

James D. Schuyler, a hydraulic engineer of Los Angeles, who is interested in electric power enterprises on the Pacific Coast and elsewhere was a recent San Francisco visitor.

G. R. Field, assistant general manager of the Great Western Power Company, recently returned to his San Francisco office after paying a visit to the site of the Big Meadows dam.

J. P. Dunphy, who was formerly district superintendent at San Francisco, has gone to Seattle, where he will have the same title with the Pacific Telephone & Telegraph Company.

Joseph H. Handlon, claims agent of the United Railroads, returned to San Francisco last Saturday, after attending the sessions of the National Street Railway Association at Atlantic City.

M. C. Hixson, formerly with the meter department of the Pacific Gas & Electric Co., is now acting as chief electrician at Stanford University in conjunction with some technical studies which he is pursuing.

J. H. Leary, for many years chief dispatcher for the Southern Pacific Company at the Oakland mole and the Third and Townsend depot, has been appointed superintendent of the Central California Traction Company with office at Stockton, Cal.

O. C. Pratt, president of the Indian Valley Light & Power Company, will leave for Quincy, November 7th, to attend the annual meeting of the stockholders of the company, which operates a hydroelectric plant at Greenville, Plumas county. Several extensions of the power lines are projected. The company's San Francisco office is at 1108 Crocker Building.

Leon M. Hall, electrical engineer, spent last week at Los Banos in connection with an irrigation project, involving the construction of a system of ditches and a dam which will form a reservoir having an area of 100 acres.

H. A. Lardner, manager of J. G. White & Company's Pacific Coast branch, has returned to San Francisco after inspecting the work on the great dam at Crane Valley, which will be completed about January 1, for the San Joaquin Light & Power Company.

Leslie R. Coffin has been appointed manager of the Whatcom County Railway & Light Co. of Bellingham, Wash., in which capacity he has been acting since the appointment of the former manager, L. H. Bean, as manager of the Tacoma Railway & Power Co.

C. H. Gaunt, general superintendent of the Western Union Telegraph Company's Pacific Division, recently returned to his San Francisco headquarters after a trip to New York, H. F. Dodge, division commercial superintendent met Mr. Gaunt on Puget Sound and came south with him.

Harry L. Worthington has accepted the position of superintendent of distribution with the United Light & Power Company, effective November 1. He has occupied a similar position in the electric lighting department of the San Francisco Gas & Electric Company during the past four years.

R. Nakakoji, vice-minister of the department of communication of the Japanese government, which has charge of the imperial railroads, telephones and telegraphs, accompanied by two secretaries, H. Suzumura and S. Uchida, was entertained at Seattle this week while returning from England to Japan.

J. M. Howell, the hydraulic engineer who did much of the preliminary work for the Great Western Power Company's hydraulic system at the Big Bend of Feather River and at Big Meadows, recently returned from a stay of several years in Japan and will reside permanently at Berkeley.

S. N. Griffith of Fresno who was formerly at the head of the Fresno Traction Company, recently spent some days at San Francisco. He has completed the surveys for an electric road from Fresno to Clovis, and on its completion he purposes to build a connecting line, fifty miles in length, via Centerville and Reedley to Orosi.

TRADE NOTES.

The Standard Underground Cable Company has opened a branch office at 707 Electric Building, Cleveland, Ohio.

Arthur S. Bent Co. of Los Angeles recently installed 12 miles of 36-in. concrete pipe from Barker Meadows to the Kossler power house of the Central Colorado Power Company.

John Ross Wade, of Chico, has purchased a complete golddredge equipment from the Westinghouse Electric & Manufacturing Company. It includes a number of 2200 volt induction motors ranging from 150 h.p. down to 30 h.p. Special precautions have been taken to prevent injuries to the men operating the dredge. Each motor is equipped with a magnetic brake and has an individual circuit breaker. The scene of the operations is to be at a point 15 miles north of Chico.

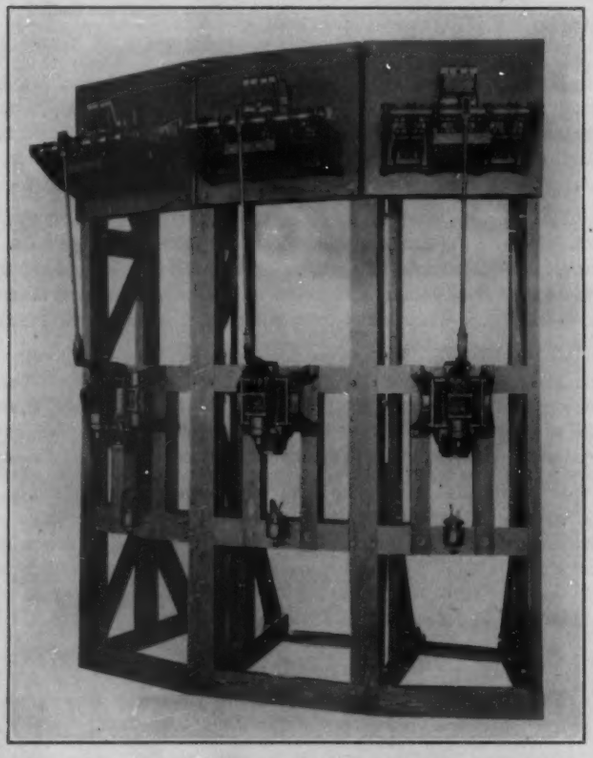
The Westinghouse Electric & Manufacturing Company report the closing of a contract for a complete electrical equipment for the operation of the Valley Ice Company's large new ice plant at Bakersfield. A number of 440-volt induction motors, ranging from 200 h.p. down to 10 h.p., will be installed. The ice-making capacity will be 300 tons per day and the plant will be ready for operation next February. The Valley Ice Company's plant at Fresno, which began operations July 1, is said to be the first in the United States to be operated throughout by electric motors. Steam engines were used to drive the ammonia compressors in the past. Westinghouse motors are used throughout this plant. The compressor is belted to a 500 h.p. motor.

INDUSTRIAL

A LARGE ALTERNATING CURRENT CIRCUIT-BREAKER INSTALLATION.

The construction of a circuit-breaker for use on heavy alternating current circuits presents a somewhat difficult problem to the designing electrical engineer. To ensure the distribution of the current uniformly throughout the various parts of the breaker and the avoidance of skin effect, energy losses in heating, etc., requires very skillful designing.

The largest alternating current circuit-breaker yet built is installed in the worsted mills of the American Woolen Company at Lawrence, Mass., and protects a 600-volt, 40-cycle turbo alternator. It is a triple-pole solenoid operated,



12,000 Ampere, 600 Volt Circuit Breaker

type C, Form K-2 breaker, built by the General Electric Company, and has a current carrying capacity of 12,000 amperes continuously without overheating.

If a circuit-breaker for use on heavy alternating current circuits of 6000 amperes and over were built on the lines of usual direct current construction it would not perform its work satisfactorily and would heat to a dangerous degree in service. To avoid this, special construction must be employed.

In the design of the circuit-breaker in question, a large amount of radiating surface was provided and uniform distribution of the current throughout the various parts was ensured by subdividing the contact brushes and the studs of each pole into six sections, each section insulated from the others. Each pole of the circuit-breaker is operated by a separate solenoid mechanism so connected that the entire triple pole breaker is controlled by a single control switch on the switchboard panel. The open and closed positions of the breaker are indicated by pilot lamps located at the controlling switch.

To obviate the necessity of opening an arc at the control switch, the circuit of the closing coils is opened by relays located near the circuit-breaker after the latter closes. The circuit-breaker trip coils are opened by auxiliary switches on it, which open when the breaker itself opens. The device is made automatic by the use of current transformers and relays. The circuit-breaker, solenoids and control relays are mounted on specially designed hard wood supporting framework made to conform to the perimeter of the turbine to which the framework is secured.

The breaker has now been in service for several months and is operating satisfactorily. This, however, is not more than was expected because, before shipment, after being well tried out for purposes of adjustment and to discover any weak points in construction, the breaker was subjected to thorough mechanical endurance tests under conditions much more severe than it could possibly be expected to endure in actual service.

BENJAMIN LARGE BASE RECEPTACLES.

The advent of the new 400 and 500 watt Mazda lamp has created a demand for suitable sockets and fixtures with large base receptacles. To meet these new conditions and thus remove the chief obstruction to their commercial introduction, the Benjamin Electric Company have designed, and are now placing upon the market, a number of sockets and receptacles especially intended for large base lamps.

No. 69—Multiple.

No. 79—Series Film Cut-out.

The accompanying illustrations show two sockets. The No. 69 is intended for use on low-voltage circuits not requiring cut-out or short-circuiting mechanism. It has spring center contact, wires lead in the sides, and the binding screws are accessible from the central opening. No. 79 is a two-piece series cut-out socket with short-circuiting center contact for high-voltage street-lighting circuits. It has side connections and will receive wires as large as No. 6. Both of these are adapted for attaching to a surface or bracket by means of screws passing through the base.

TRADE NOTES.

R. P. Starkweather, pole line contractor, San Francisco, is installing 25 miles of trolley line for the Oakland Antioch Electric Railway Company between Bay Point, Lafayette and Martinez. He is also overhauling 25 miles of the Snow Mountain Power Company's lines at Ukiah.

Hunt, Mirk & Co., representing the Westinghouse Machine Co., report that the San Diego Electric Railway Company, has purchased a 1000 kw. exhaust turbine generator fitted with the Westinghouse-Melville-MacAlpine reduction gear. This generator set is the first of that type sold on the Pacific Slope. The rotor of the turbine makes 3600 r.p.m., while the 600 v. d.c. generator has a speed of 514 r.p.m. The agents say that there is a big field for such d.c. turbo-generators in connection with the operation of centrifugal pumps in California.

NEWS NOTES

INCORPORATIONS.

PORTLAND, ORE.—The Independent Electric Company have incorporated for $100,000. E. W. Hardy, 405 Chamber of Commerce Building, Portland, is interested.

LOS ANGELES, CAL.—The Pacific Ocean Power Company of California has been incorporated by W. N. Brassington, C. J. Stoneham and G. D. Snyder, with a capital stock of $10,000.

OLYMPIA, WASH.—Incorporation articles have been filed by Chas. C. Gentry, Walter Strange and Arpad Tokey for a Monorail Railway Company to connect Bellingham, Port Angeles, Irondale and other cities. The company is capitalized at $7,000,000.

FINANCIAL.

VALE, ORE.—The taxpayers have voted to bond the city in an additional sum of $33,000 to build a gravity water system from Willow Springs, 12 miles south.

OCEANSIDE, CAL.—The City Council has passed an ordinance providing for the issuance of bonds of $20,000 voted for on September 14th for the construction of a water-works system in this city. The bonds will be 40 in number and of $500 each, bearing 5 per cent interest per annum, payab'e semi-annually. Bond No. 1 will run one year; No. 2 two years; No. 3 three years, etc.

TRANSPORTATION.

PORTLAND, ORE.—The Portland Railway, Light & Power Company will extend its Cazadero line 3½ miles.

SALEM, ORE.—The Santiam Development Company has applied for a franchise here and proposes to build an electric line between this place and Stayton.

LOS ANGELES, CAL.—The Los Angeles Pacific Railway Company will at once put 1400 more men to work on the tracks between Los Angeles and Hollywood relaying and paving that line.

LOS ANGELES, CAL.—A two mile extension of the Los Angeles Railway Company's system is announced by which Thirty-ninth street will have a street car line from McClintock street to Western avenue, connecting it with the University line.

POCATELLO, IDAHO.—Judge A. Z. Watson of Chicago, representing a syndicate of capitalists of that city, states that an electric railway is contemplated from American Falls to Malad, Idaho. It is stated that the proposed line has been surveyed and that a company is being formed offering stock for sale.

PORTLAND, ORE.—F. A. Nelson, the inventor of an automatic street car fender and who has been in the city for several months in the interests of the concern manufacturing it, announces that he contemplates building a plant in this city for the manufacture of the fenders to be used on the Coast. He will immediately secure a site and build a factory.

LOS ANGELES, CAL.—The Pacific Electric Railway Company has adopted sketches prepared by Architect C. E. Shattuck for new passenger station to be erected at Pine and Seaside Boulevard, Long Beach, and working drawings will be started at once. The construction will be steel and brick with concrete foundation and pressed brick exterior. There will be a ticket office, curio store, checkroom, ladies' restroom, cafe and kitchen on first floor.

SACRAMENTO, CAL.—The Northern Electric Railroad will completely circle the city with its tracks in the near future if the plans as outlined last week to the City Board of Trustees by Attorney A. N. Seymour meet with the approval of the municipal governing board. Seymour made application for a franchise granting the right to the company to lay its tracks on I street from Seventh to Second, on Second from I to M and on M street to the alley between Second and Front.

FRESNO, CAL.—S. N. Griffith announced at the regular bi-weekly meeting of the real estate board that he has financed and will shortly build an electric railroad between this city and Clovis. He stated that he has secured about three-fourths of the right of way for this road, and that the beginning of actual construction will follow upon the securing of the remainder of the right of way, which he expects soon to have accomplished. He further mentioned without details that he will shortly announce plans for another interurban electric road to run out about 50 miles from Fresno, but declined to state the route and destination of this line. During the past summer he secured financial backing for the construction of an interurban railroad system, of which the Clovis road will be a starter. He estimates that the total expenditure on this enterprise, complete, will be about $2,000,000. The expense of the work of construction he figures at $30,000 a mile complete with rolling stock, and other equipment.

OAKLAND, CAL.—Several new street railway franchises were applied for by the Oakland Traction Company at a recent meeting of the City Council. The most important is for a line on Clay street from Eighth to Seventeenth street, connecting the San Pablo and West Eighth street lines. The company would also like to extend its Thirteenth street line from the present terminus at Washington street west along Thirteenth to Market and thence north to the tracks at Fourteenth and Market. The company also asks to be permitted to extend its Thirteenth street line from Thirteenth and Washington streets on a curve to connect with Washington street. A franchise is asked for a line beginning at Market street and San Pablo avenue running north across San Pablo avenue to Market street and thence north on Market street to Fifty-fifth street and the Key Route tracks. An important extension asked for is that beginning at Hopkins street and Thirty-fifth avenue, known as the Redwood road, running northwesterly on Hopkins street to Peralta avenue, thence southwesterly upon and across Peralta avenue to Hopkins street northwest of Peralta avenue and thence northwesterly along Hopkins street to the company's tracks in Hopkins street and Fruitvale avenue.

LOS ANGELES, CAL.—All the city lines of the Pacific Electric Railway Company, with their entire equipment, have been purchased by the Los Angeles Railway Corporation for about $12,000,000. The deal is one explanation of the Los Angeles Railway Corporation's recent increase of capitalization from $6,000,000 to $20,000,000. The absorption of the so-called red lines by the yellow means universal transfers, and is expected to be of great benefit to the public, because the buying company will make many improvements and additions, and bring the service up to its own high standard. The system acquired was formerly that of the traction company built by the Hooks, afterward bought by Huntington's interurban company and later absorbed by the Pacific Electric. It reaches far in all directions with a few tracks, and will be a valuable groundwork for the Los Angeles Railway Corporation's constant construction of feeders. The new roads ac-

quired will make the mileage of that big corporation in excess of 350. H. E. Huntington is president and virtual owner, though most of the stock was issued to his son, Howard E. Huntington, the general manager. The elder Huntington also retains control of the Pacific Electric, which is directing its energies to further fields, and is expected to stretch its 600 miles of trackage to 1000 within two years.

ILLUMINATION.

LIVE OAK, CAL.—The Live Oak and Encinal Electric Light Company is making preparations for an extension of its line north of Live Oak.

SAN FRANCISCO, CAL.—The Pacific Power & Light Company has declared an initial dividend of 1¾ per cent on the preferred stock, payable November 1, to stock of record October 24.

ELLENSBURG, WASH.—The bill of the Olympic Foundry Company of Seattle to furnish 14 cluster light poles complete with globes at a cost of $46.90 each has been accepted by the council and the company will ship the lights.

OCEANSIDE, CAL.—E. V. Griffes, local manager of the Oceanside Gas & Electric Company, is figuring on electric wires to Fallbrook, where he will furnish that town with light. The system will cost about $4000 and Mr. Griffes will probably install it.

CLAYTON, N. M.—The city water and electric light plant owned by Territorial Land Commissioner Robert Ervein, now of Santa Fe, has been taken over by the city board of Clayton. Bonds for $50,000 will be voted as soon as an election can be called and an entire new system of water and electric lights will be built within the coming year.

NEWPORT, CAL.—The City Clerk will receive sealed bids up to December 12th for a franchise to erect poles and uprights in the public streets and alleys of this city and to equip poles with brackets, cross-arms and other means and appliances for placing and stringing wire and cables for the conveying and transmission of electric energy for light, heat and power.

HANFORD, CAL.—Suit has been brought against the city of Hanford by the Hanford Gas and Power Company for the refunding of a $700 franchise tax which was paid under protest in two different years. The case is an attack on the provision of the company's franchise which requires it to pay 2 per cent of its gross earnings each year after the fifth year of operation. The company contents that the city has no right to impose this franchise tax.

BAKERSFIELD, CAL.—B. C. Oliphant of Buffalo, N. Y., manager of the California Natural Gas Company, which was recently incorporated in San Francisco to conserve for domestic purposes the great gas production of the Midway territory, is now in Bakersfield with officials of the Standard Oil Company, which owns the gas wells. He says actual work on the new company's plant will commence early in December. The company already has in the Midway district material ready for laying 30 miles of 4-inch pipe. The central plant will be established on section 26, where the Standard's biggest well is located.

COALINGA, CAL.—Taft's new gas plant is in operation and several places are using the fuel. Other houses are being connected with the mains as rapidly as the work can be done. No lights have yet been installed, as the company wishes to get the receivers into place first to insure the steadiest pressure. The receivers have been shipped, but have been delayed in arrival. The natural gas is brought here through a 2-inch steel main, under a pressure of 300 pounds. The capacity is 250,000 cubic feet per hour, so there is no danger of there not being enough to go around. At the works it passed through valves to bring the pressure down to the required amount.

TRANSMISSION.

WHITE SALMON, WASH.—The Husum Power Company will erect a concrete dam here.

CHINOOK, MONT.—The City Council has taken up the question of building an electric light plant.

PORTLAND, ORE.—The Portland Railway, Light & Power Company will erect a 15,000 h.p. steam plant in East Portland.

HERMISTON, ORE.—B. A. Chisolm of Meadows, Idaho, is negotiating with the city authorities of this place for the erection of a light plant.

TACOMA, WASH.—The Chicago, Milwaukee & P. S. Railway will erect a $5000 power house 80x22 at East Twenty-fifth and Portland avenue.

VANCOUVER, B. C.—The Dominion engineer, J. R. Freeman, has announced that the Vancouver Power Company, may build an 85-foot dam at Coquitlam, providing certain conditions are observed.

CRESTON, B. C.—The International Electric Company of Nelson, B. C., and Portland, Ore., has filed on the water powers of the Pend d'Oreille river and a development scheme to utilize the powers will be inaugurated in the near future.

SPOKANE, WASH.—Mayor Pratt is advocating the purchase of a city power plant. The proposed site if acquired would be located on upper Spokane river, to develop about 6000 h.p. W. Moore, city hydraulic engineer, who has prepared preliminary estimates, states that the proposed plant would cost $500,000.

PORTLAND, ORE.—The Independent Electric Company which incorporated in Multnomah county with a capital stock of $100,000 by H. G. Fleischauer, F. W. Wall and Ernest Hardy has completed negotiations for the purchase of the Hillsboro Water, Light & Power Company and the Haines Light & Power Company, which controls a water-power plant 16 miles from Forest Grove. Plans of the new company contemplate the expenditure of several hundreds of thousands of dollars for improvements and extensions, and consider the extension of the company's power lines to Beaverton, Orenco, Cornelius, Diley, Gaston and cities along the line of the Oregon Electric between Beaverton and Forest Grove. B. M. Boykin, who has an office at No. 502 Fenton building has been made president of the new corporation. Light and power will be supplied to all regions within a radius of 20 miles from the site of the Haines plant.

SAN FRANCISCO, CAL.—The effort to merge several power companies in this State, which has been the objective of Bylesby & Co., a Chicago bonding house, for several months, has failed, according to the statements of several members of these companies. It was reported that this projected merger was to be in the interest of the General Electric Company which is said to be a creditor of these small companies for large sums, that the Bylesby & Co. were acting for the General Electric. The companies mentioned as having been approached on the subject are the Stockton Gas Company, the Humboldt Light & Power Company, Haywards Gas & Electric Company and the Northern California Power Company. H. H. Noble, president of the last-named company, said that several weeks ago a broker had asked him for an option on the properties, and that the option had been given for a short period. He said the price was evidently too high, as no use was ever made of the option. The only company which Bylesby & Co. succeeded in bonding was the Humboldt Light & Power Company, with a plant on the Trinity river.

BAKERSFIELD, CAL.—Preparations are being made for the shipment of the material for the power line through the oil fields of the San Joaquin Light and Power Company to this city. The work of construction will begin from this end of the

PROFESSIONAL DIRECTORY

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line within the next two weeks. The plan is to run a loop from the power plant near Fresno through the oil fields, by way of Bakersfield, returning through Coalinga. This vast undertaking will require some time to complete, but when the line has been built the oil companies will be assured of steady power under all conditions. The work of construction will begin simultaneously at Fresno and at Bakersfield, the Fresno crew working toward Coalinga on the loop while the Bakersfield crew will build the line between this city and Moron. The two construction gangs will meet somewhere in the oil fields, completing the loop. The company will then have the use of four power plants for their own needs and for their customers. There is a 27,000 h.p. plant situated outside of Fresno and another 2500 h.p. plant inside the city. At this city they have the old 2000 h.p. plant in the canyon which was used by the P. T. & L. Co. and the new 2500-h.p. plant in this city which has been completed recently.

SAN FRANCISCO, CAL.—A big power deal was consummated when the Pacific Gas & Electric Company contracted to handle the output of the Great Western Power Company for a long term of years. The negotiations have not entirely closed, according to President Drum of the Pacific Gas & Electric, but they are sufficiently progressed to be only a matter of the exchange of signatures and other formalities. The Great Western Power Company, which has invested about $15,000,000 in its plant, has been producing 40,000 kw. of electric energy for some time, about two-thirds of which has been purchased by the Pacific Gas & Electric Company, as the former corporation has no distributing systems or retail markets for its power. The negotiations were carried on in New York, where the Great Western Power Company has its executive offices, between Edwin Hawley, president of the company, and N. W. Halsey & Co., the financial agents of the Pacific Gas & Electric Company. President Drum has denied that his company guaranteed to meet the dividends on any of the stock of the Great Western Power Company. He added that the Pacific Gas & Electric Company merely contracted to buy at a fixed price whatever power the Great Western Power Company could produce for a long term of years.

WATERWORKS.

WASCO, CAL.—The stockholders authorized the directors to install a complete system of domestic water upon the townsite of Wasco. The cost is given at $1300.

OAKLAND, CAL.—A resolution has been adopted directing the People's Water Company to install double outlet hydrants on East Fourteenth street and on all intersecting streets between Fruitvale and High street.

LONG BEACH, CAL.—The Alamitos Land & Water Company is preparing to enlarge its water system. It is the intention of the company to double the system and extend it throughout the city. New mains will be laid and the reservoir will be doubled.

OAKLAND, CAL.—At the annual meeting of the People's Water Company of Oakland last week the existing board of directors was re-elected by the stockholders. Report of the officers were made and the directors went into executive session to consider matters of future action which are to be made public soon.

SAN FRANCISCO, CAL.—Refusal on the part of the Spring Valley Water Co. to consider the proposition of Mayor McCarthy that the city should purchase the plant of the company for $33,000,000, or even for $35,000,000 as formerly agreed, was made last week at the water conference held in the Mayor's office in the Crocker building. The next conference will be held Wednesday evening, November 9, at the Mayor's office, and will be an executive session, when an effort will be made to reach an agreement.

NEW CATALOGUES.

Catalogue B-19 from the Benjamin Electric Mfg. Co., Chicago and San Francisco is an illustrated reference book on Benjamin wireless clusters and lighting specialties.

Bulletin No. 4778 from the General Electric Company is devoted to the Edison Carbon Incandescent Lamp, which are here rated by the three voltage method and in total watts.

Polyphase Maximum Watt Demand Indicator, Type W for recording on alternating current circuits irrespective of power factor and voltage fluctuations is illustrated and described in Bulletin No. 4768 from the General Electric Co.

Bulletin No. 4765, entitled "Isolated Plant—Direct Current Combination Generator and Feeder Panels," recently issued by the General Electric Company, supersedes the previous bulletin issued by this company on that subject.

Booklet 4024 from the Allis-Chalmers Co. sets forth some of the features of Allis-Chalmers lighting transformers for central stations dealing particularly with the factors of safety, ruggedness, efficiency, weight, regulation and cost.

Dossert & Co. have just issued an eight-page folder which illustrates and describes a number of new Dossert specialties, particularly a new anchor connector for use with strain insulators and a new insulated cover for cable taps.

Bulletin No. 14 from the Century Electric Co., St. Louis, and San Francisco, handsomely portrays Century Single Phase Motors. Supplementing a well written text regarding this repulsion induction motor are a series of excellent half tones showing its construction and its varied application. This catalogue is well printed with tint blocks on each page and is attractively bound in double blue cover.

A bulletin was recently issued by the General Electric Company, entitled "Engine Type Continuous Current Generators, Forms RB and RBO for Lighting and Power." The bulletin illustrates and describes direct current generators for two and three wire systems, from 25 to 250 kw., and for standard voltages.

The General Electric Company has recently issued a bulletin describing the GE Tantalum Incandescent Lamp for general illumination. It illustrates and describes lamps for 100 to 125, and 200 to 250 volts, compares the cost and efficiency of these lamps with those of the carbon and Gem lamps, and contains considerable data of use to those interested in the subject. The number of this bulletin is 4766.

The Westinghouse Electric & Manufacturing Company has just issued its Circular 1098 on the subject of Switchboard Indicating Meters. The publication outlines the cardinal points to be kept in mind in the selection of meters. It describes direct current and alternating current indicating meters, including frequency meters and power factor meters; synchroscopes, and instrument transformers.

The Westinghouse Electric & Manufacturing Company has just issued a revision of its Circular 1118 on the subject of its Type CCL Polyphase Induction Motors. The circular describes the electrical and mechanical features of these motors and shows some very interesting pictures of their applications. The circular also includes some short descriptions of the various starting devices used with squirrel cage induction motors.

Bulletin No. 4775, issued by the General Electric Company, entitled "Type KS Single-Phase Induction Motors," describes a motor offered by the General Electric Company to meet the power requirements of establishments which, for some reason, are unable to secure other than single-phase current. This motor is, in general, adapted to drive geared and belted machinery requiring constant speed with light or moderate starting torque. It is made in capacities of from 1 to 15 horsepower, and wound for 110 or 220 volts, 60 cycles.